REMARKS

Claims 1, 2, 4-9, 11-17, and 19-26 are currently pending. Applicant has directed herein the cancellation of claims 3, 10, and 18, and newly presents for examination, claims 22-26. An Amendment Transmittal Form is enclosed.

In the Office Action mailed April 9, 2003 the Examiner objected to the drawings as well as the Specification. The Examiner then rejected claims 1-21 under 35 U.S.C. §102(e) as being anticipated by Blake et al. (USP 6,275,560).

The Examiner objected to the drawings for failing to include a "Prior Art" designation for Figures 1, 2 and 3. The Examiner concluded that "only that which is old is illustrated". Applicant respectfully disagrees with the conclusion reached by the Examiner and believes that more that which is old is illustrated in Figures 1-3. Figures 1-3 illustrate CT systems configured to and capable of carrying out the inventions called for in claims 1, 2, 4-9, 11-17, and 19-26. Applicant believes that which is called for in each of the aforementioned claims to be novel and, as such, Figures 1-3 are believed to illustrate more than that which is old. For example, claims 7-9 and 11-14 are drawn to a novel radiation emitting imaging system. Examples of such a system are shown in Figures 1-3. Withdrawal of the objection to the drawings is therefore requested.

Similar to the objection to the Drawings, the Examiner objected to the Specification because "Figure 1, 2 and 3 should be described as prior art". As pointed out above, that which is shown in Figures 1-3 is not prior art. Accordingly, Applicant requests withdrawal of the Examiner's objection for reasons similar to those set forth above with respect to the objection of the drawings.

Claims 1-21 stand rejected as being anticipated by Blake et al. Blake et al. teaches a cardiac gated computed tomography system that utilizes short bursts of x-rays to acquire data from a selected portion of a heart cycle of a patient. Col. 3, lns. 2-6. Specifically, Blake et al.

teaches a synchronization unit that "transitions the state of the x-ray-on signal after delaying a selected period of time from the heart cycle representing the selected portion of the heart." Col. 3, lns. 47-50. In this regard, x-rays are only emitted during the selected period of the heart cycle. Col. 3, lns. 51-52. In an exemplary embodiment, Blake et al. describes transitioning the x-ray power source from zero volts to approximately 150 kilovolts in approximately 2 milliseconds, maintaining a 150 kilovolt output for 100 milliseconds, and returning to zero volts in approximately 200 milliseconds. Col. 4, lns. 11-17. Simply, the x-ray power source is driven to a non-zero voltage during a data acquisition portion of the cardiac cycle and driven to a zero voltage during another and non-data acquisition portion of the cardiac cycle. As a result, x-rays are emitted only during a portion of the cardiac cycle and data is only acquired for the selected period. Col. 4, lns. 20-21 and 36-37.

In contrast, the present invention is directed to a cardiac CT imaging process and system wherein a high frequency electromagnetic energy (i.e. x-ray) projection source is energized to a first voltage during a primary or first acquisition period of a cardiac cycle and energized to a second voltage during a secondary or second period of the cardiac cycle. As such, during one segment of the cardiac cycle, the x-ray source is energized to a greater voltage than during another segment of the cardiac cycle. However, throughout the entire cardiac cycle the x-ray source is at least minimally powered.

The Examiner contends that Blake et al.'s teaching of powering an x-ray source to a first non-zero voltage followed by a powering to a second zero voltage during a single cardiac cycle is equivalent to that presently claimed. However, one skilled in the art would readily recognize that a "zero" voltage level does not require energization. In fact, zero voltage is the absence of energy. Therefore, Applicant's claiming of "energizing the high frequency electromagnetic energy source to a second voltage..." clearly indicates that the x-ray source is not at a zero voltage during a secondary acquisition period.

In this regard, data acquisition occurs during both the primary acquisition period and the secondary acquisition period, i.e. throughout the entirety of the cardiac cycle. Since Blake et al. teaches driving the x-ray power source to a zero voltage during a portion of the cardiac cycle, portions or phases of the cardiac cycle are not imaged. That is, it is not possible to acquire data unless the x-rays source is minimally powered. Accordingly, utilizing the method taught by Blake et al., each phase of the cardiac cycle would have to be separately imaged in a separate scan thereby increasing dosage to the patient and/or increasing overall scan time similar to the scan-and-shoot method discussed in the Background of Invention section of the present application. That is, to acquire data for all phases of the cardiac cycle in accordance with the method taught by Blake et al. would require multiple scans because Blake et al. explicitly teaches data acquisition for only a portion of the cardiac cycle. Moreover, Blake et al.'s method results in each imaged phase of the cardiac cycle being subjected to the same amount of radiation dose if each phase of the cardiac cycle is imaged. Additionally, the process of Blake et al. makes no provision for regions of the cardiac cycle that are to be imaged but not imaged at the maximum radiation dosage. Therefore, Blake et al.'s method neither reduces scan time nor reduces patient dosage.

Claim 1 calls for a method of voltage modulation for CT imaging that includes the steps energizing a HF electromagnetic energy source to a first voltage and acquiring a set of imaging data. The method further includes the step of after acquiring the set of imaging data, energizing the HF electromagnetic energy source to a second voltage until a period of delay after a next triggering pulse of a cardiac cycle. Blake et al. teaches driving the energy source to a zero voltage. Claim 1 calls for energizing to a first voltage and energizing to a second voltage. As pointed out above, "energizing" implies a non-zero voltage and, as such, Blake et al. fails to teach or suggest that which is called for in claim 1. Allowance thereof as well as claims 2 and 4-6 depending therefrom is requested.

Claim 7 calls for a radiation emitting imaging system that includes, in part, a control configured to energize a HF electromagnetic energy projection source to a first voltage during a primary data acquisition stage and to a second voltage during a secondary data acquisition stage. The control is further configured to reconstruct an image from data acquired during each data acquisition stage. As noted above, to acquire data, the projection source must be minimally energized. Further, claim 7 calls for image reconstruction of data from each data acquisition stage. Blake et al. teaches data acquisition for only one stage of a two stage cardiac cycle. Therefore, Blake et al. fails to teach the reconstruction of an image from data acquired during each stage of a cardiac cycle. As such, the system called for in claim 7 as well as claims 8, 9 and 11-14 is patentably distinct from that taught and described by Blake et al.

Claim 15 calls for a computer readable storage medium having a computer program stored thereon and representing a set of instructions that when executed causes the computer to transmit a first voltage modulation signal to a voltage source configured to energize an x-ray projection source to a first voltage during each primary data acquisition stage of a cardiac cycle. The computer is further caused to transmit a second voltage modulation signal to the voltage source configured to energize the x-ray projection source to a second voltage during each secondary acquisition stage of the cardiac cycle. For reasons similar to those set forth above, the presently claimed invention is patentably distinct from that taught by Blake et al. Allowance of claims 15-17 and 19-21 is therefore requested.

Applicant requests entry and consideration of claims 22-26 newly presented herein to further define the present invention. For reasons similar to those set forth above, Applicant believes that which is called for in claims 22-26 is patentably distinct from that taught by the art of record. Allowance thereof is therefore requested.

In light of the foregoing Amendments and Remarks Applicant respectfully believes the present application is in condition for allowance and therefore requests a Notice of Allowance for claims 1, 2, 4-9, 11-17, and 19-26.

Applicant invites the Examiner to contact the undersigned with any questions to expedite the handling of this matter.

Respectfully submitted,

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